

Hydrogeophysics. YORAM RUBIN and SUSAN S. HUBBARD (ed.) Water Science and Technology Library Series, Vol. 50. 2005. Springer, Dordrecht, The Netherlands. Hardcover, 523 pp. \$99.00. ISBN: 1-4020-3101-7.

Developments in the computational power of computers, efficient numerical algorithms, and user-friendly software have greatly increased the popularity of subsurface flow and transport models. Models are now widely used for groundwater resources management, groundwater contamination risk assessment, and the design of groundwater remediation projects. Parameterization of these models, however, remains a challenging task due to the inaccessibility of the subsurface and the spatial variability of its properties.

Geophysical techniques have been developed and were primarily used in the mining and petroleum industries for more than 100 years to explore and image the subsurface. Only recently have geophysical techniques been applied for mapping of subsurface properties that are relevant for hydrological applications. The book *Hydrogeophysics* covers the state of the art in this emerging field of research at the interface of geophysics and hydrogeology. The book contains 17 chapters in four sections and is written by an international group of leading experts.

The first part focuses on hydrogeological characterization of the subsurface and includes experimental methods to determine the spatial variability of hydraulic conductivity and geostatistical methods to evaluate spatial variability. The second part presents geophysical techniques that are often used for mapping of hydrologic properties and for monitoring flow and transport processes. This includes DC resistivity and induced polarization tomography, controlled source electromagnetic induction, ground penetrating radar, seismic methods, geophysical well logging, and airborne hydrogeophysics. Using geophysical methods, images of electric and seismic property distributions in the subsurface are obtained. Two separate chapters discuss how these properties can be translated or linked to hydrogeological properties or hydrological state variables.

The third part of the book presents a set of hydrogeophysical case studies covering a range of scales, from the laboratory scale to the local scale and to the regional scale. It covers the saturated regime as well as the unsaturated regime. The case studies illustrate opportunities and limitations of hydrogeophysical methods for mapping hydrogeological parameters and monitoring flow and transport processes. The presented studies also illustrate that the potential of hydrogeophysics is more than a geophysical characterization followed by hydrogeological interpretation. An improved characterization can be achieved by hydrogeological and geophysical data fusion, by merging hydrogeological process understanding with a geophysical monitoring of subsurface flow and transport processes.

In the last part of the book, "Hydrogeophysical Frontiers," a general stochastic framework is presented to combine different sources of information, prior knowledge, and process understanding. In addition to new methods that interpret data sets, new technological developments, such as spectral nuclear magnetic resonance and magneto-electrical resistivity imaging are presented in a separate chapter.

The book contains a wealth of information and represents a comprehensive overview of the state of the art in hydrogeophysics and its applications. Although I am enthusiastic about the contents of the book, I was disappointed by the poor quality of some figures and tables that were scanned with a too low resolution. Readers who want to gain more fundamental insight into the different presented techniques and methods are provided with many useful references. The book illustrates clearly that the research field of hydrogeophysics is still strongly developing, as many future research needs are identified.

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